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IS 10533 (1983): Valve guides for internal combustion engines [TED 2: Automotive Primemovers]



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IS : 10533 - 1983

Indian Standard
SPECIFICATION FOR
VALVE GUIDES FOR INTERNAL
COMBUSTION ENGINES

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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

Indian Standard

SPECIFICATION FOR VALVE GUIDES FOR INTERNAL COMBUSTION ENGINES

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Indian Standard

SPECIFICATION FOR VALVE GUIDES FOR INTERNAL COMBUSTION ENGINES

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 24 February 1983, after the draft finalized by the Internal Combustion Engines Sectional Committee had been approved by the Mechanical Engineering Division Council.

0.2 This standard has been prepared to achieve some measure of rationalization of and interchangeability between the valving components for internal combustion engines for all types of applications (except aircraft engines). Materials and surface finish have also been specified to help the small scale engine and valve guide manufacturers in particular.

0.3 The present practice in the country is to design valve guides on Basic Hole System (*see* IS : 919-1963*) and accordingly the dimensions and tolerances in this standard have been specified.

0.3.1 The Valves and Valve Guides Subcommittee, EDC 14 : 6 has felt that use of 'Basic Shaft System' of IS : 919-1963* could provide more flexibility to the consumer and may lead to valve guide interchangeability from one engine to another resulting in reduction of large number of sizes of valve guides presently being used and manufactured in the country. Therefore, the committee recommends that designers should prefer to use the 'Basic Shaft System' to design the guides. The data collected as a result of the adoption of this 'Basic Shaft System' would be utilized in amending the standard.

0.4 Partial Standardization has been achieved by:

- a) Specifying a range of valve guide bores related to the range of nominal valve stem diameters given in IS : 810-1974†, and
- b) Specifying bores in the cylinder block or head to receive the valve guides.

*Recommendations for limits and fits for engineering (*revised*).

†Specification for inlet and exhaust valves for internal combustion engines (*first revision*).

0.5 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This Indian Standard covers the general requirements for cast iron valve guides for internal combustion engines (stationary, automotive and marine).

1.2 Valve guides whose bores are not finished to size in the cylinder block or head are also covered by this standard.

2. TYPES

2.1 The valve guides shall be of the following two types:

- a) *Type A* — Plain type (*see* Fig. 1), and
- b) *Type B* — Shoulder type (*see* Fig. 2).

3. TERMINOLOGY

3.0 For the purpose of this standard, the following definitions shall apply (*see also* Fig. 1 and 2).

3.1 Counter Bore — It is the inside relief provided on the hotter end of the valve guide for the accumulation of carbon deposit. This relief is generally provided in the exhaust valve guides.

3.2 Shoulder — It is the projected portion of the valve guide which rests on the cylinder head.

3.3 Under-cut — It is the relief provided under the shoulder to ensure proper seating of the valve guide on the cylinder head.

4. DIMENSIONS AND TOLERANCES

4.1 The recommended dimensions for Type A valve guides are given in Table 1 read along with Fig. 1.

4.2 The dimensions for Type B valve guides are not specified, but the dimensions specified for Type A valve guides may be used except for the shoulder. The shoulder dimensions may be suitably selected subject to agreement between the purchaser and the supplier.

*Rules for rounding off numerical values (*revised*).

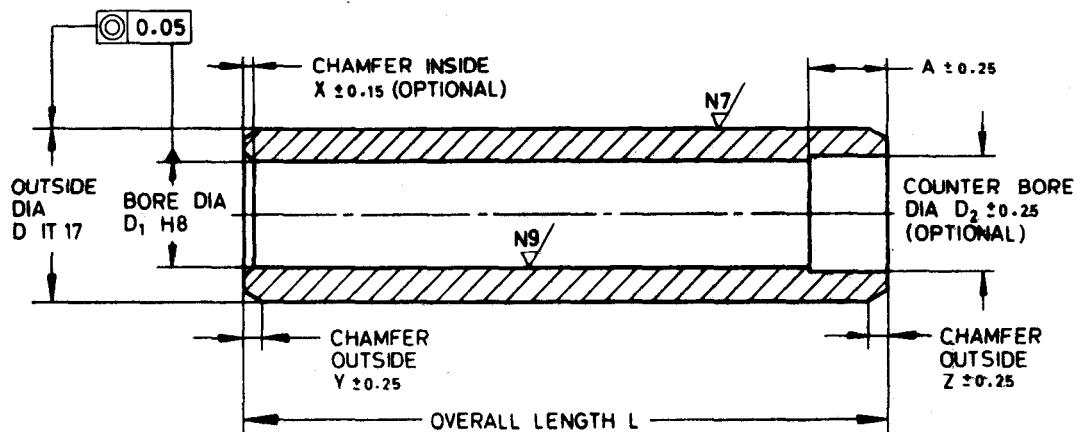
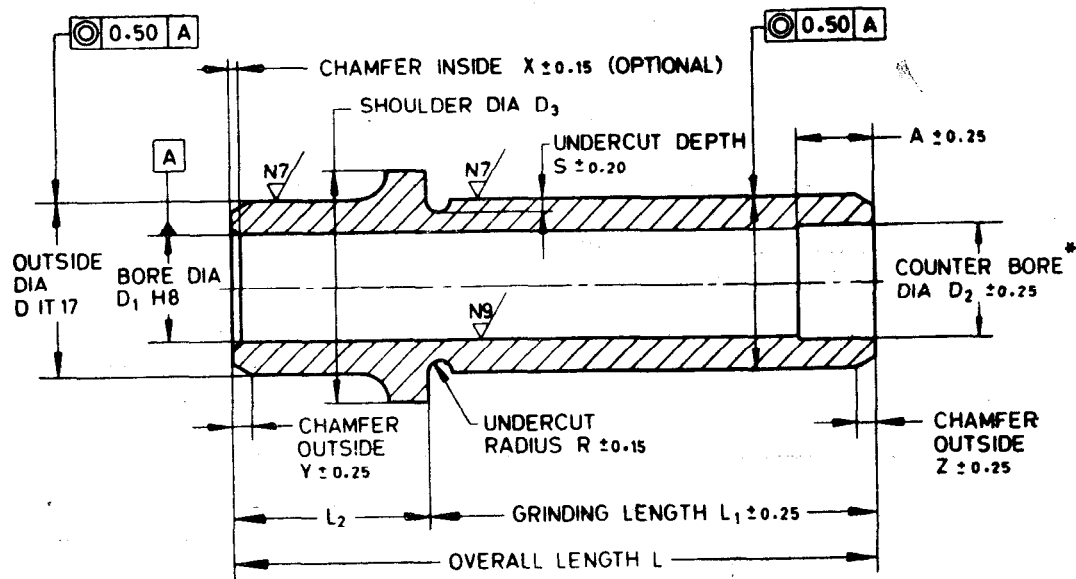


FIG. 1 PLAIN TYPE (TYPE A) VALVE GUIDE



*Optional

FIG. 2 SHOULDER TYPE (TYPE B) VALVE GUIDE

TABLE 1 DIMENSIONS OF VALVE GUIDES

(Clause 4.1 and Fig. 1)

All dimensions in millimetres.

NOMINAL BORE DIAMETER ϕD_1 (H8)	OUTSIDE DIAMETER (NOMINAL) ϕD (IT7)	DIAMETER OF BORE TO RECEIVE THE GUIDE (NOMINAL) (H7)	PERMISSIBLE LENGTHS (NOMINAL)			CHAMFER DEPTH r, z (NOMINAL)
6	11.5	11.5	36	45	54	0.8
7	12.5	12.5	42	52	63	0.8
8	13.5	13.5	48	60	72	0.8
9	15.5	15.0	54	67	81	0.8
10	16.5	16.5	60	75	90	0.8
11	18	18	66	82	99	0.8
12	20	20	72	90	108	1.2
14	22.5	22.5	84	105	126	1.2
16	25.5	25.5	96	120	144	1.2
18	28	28	108	135	162	1.2
20	32	32	120	150	180	1.2
22	34.5	34.5	132	165	198	1.2
24	37	37	144	180	216	1.2
26	39.5	39.5	156	195	234	1.2
28	44	44	168	210	252	1.2
30	47	47	180	225	270	1.5
32	50	50	192	240	288	1.5
34	53	53	204	255	306	1.5

4.3 The recommended tolerances on the various dimensions marked in Fig. 1 and 2 are given in Table 2.

TABLE 2 TOLERANCES ON DIMENSIONS OF VALVE GUIDES

DIMENSIONS	REFERENCE IN FIG. 1 AND 2	TOLERANCE
Outer diameter	ϕD	IT7
Bore diameter	ϕD_1	H ₈
Counter bore diameter	ϕD_2	± 0.25 mm
Counter bore depth	A	± 0.25 mm
Concentricity between the bore and the outer diameter	—	0.05 mm (TIR)
Overall length	L	Medium class of IS : 2102 (Part I)- 1980*
Grinding length	L ₁	± 0.25 mm
Under-cut depth	S	± 0.20 mm
Under-cut radius	R	± 0.15 mm
All outside chamfers	r, ζ	± 0.25 mm
All inside chamfers	X	± 0.15 mm
All angular dimensions	—	Coarse Class of IS : 2102 (Part I)- 1980*

*General tolerances for dimensions and form and position: Part I General tolerances for linear and angular dimensions (*second revision*).

4.4 The tolerance for diameter D (*see* Fig. 1 and 2) may be suitably selected depending on the type of material used for the manufacture of valve guides and the cylinder head.

4.5 The deviations of taper, ovality, parallel shape and straightness shall be within the specified tolerances on corresponding dimensions.

4.6 The valve guide outer diameter is generally ground finished and the bore ream finished. However, other manufacturing processes may be followed to obtain the surface finish specified in 9.

4.7 Outside chamfers shall be 30°C. However, other chamfers required for special applications may also be used subject to agreement between the manufacturer and the purchaser.

5. MATERIAL

5.1 Valve guides shall be manufactured from good quality cast iron preferably produced from an electric furnace. The cast irons shall conform to the following standards:

- Cast irons Grade FG 260 and Grade FG 300 according to IS : 210-1978*, and
- Cast irons Grade 25 and Grade 30 according to IS : 6331-1971†, and
- Cast irons Grade 2 and Grade 2 Type A according to IS : 3355-1974‡.

5.2 The valve guide material shall be free from surface defects, such as shrinkage, pitting, scabbing, blow holes and any other similar defects which may affect reliability of valve guides in service.

6. MICRO STRUCTURE

6.1 The microstructure of the valve guide material shall be as follows:

MICROSTRUCTURE	MATERIAL			
	Grade FG 260, Grade 25 and Grade 2 (See 5.1)		Grade FG 300, Grade 30 and Grade 2 Type A (See 5.1)	
Graphite (Determined according to IS : 7754-1975§)	Form I, Distribution A, Size 3 to 5		Form I, Distribution A, Size 3 to 5	
Matrix	Lamellar pearlite		Lamellar pearlite	
	Ferrite (if pre- sent)	Less than 10 per- cent	Ferrite (if pre- sent)	Less than 5 percent
	Carbides	Less than 5 percent	Carbides	Less than 5 percent
	Phosphide eutectic	Uniformly distribut- ed	Phosphide eutectic	Uniformly distributed

6.2 In the case of highly rated and pressure charged engines for which special materials are used (subject to agreement between the purchaser and the supplier) microstructural examination is an important criteria

*Specification for grey iron castings (third revision).

†Specification for automotive grey iron castings.

‡Specification for grey iron castings for elevated temperatures for non-pressure containing parts (first revision).

§Method for designation of the microstructure of graphite in cast iron.

for acceptance of materials for the manufacture of valve guides. In such cases the limits on the micro-structural constituents shall be mutually agreed to between the purchaser and the supplier.

7. HARDNESS

7.1 The hardness of valve guide castings shall be checked in Brinell scale according to IS : 1789-1961*. The hardness of the castings shall be within the following range:

<i>Material</i>	<i>Hardness</i>
Grade FG 260, Grade 25 and Grade 2 (<i>see 5.1</i>)	180 to 250 <i>HB</i>
Grade FG 300, Grade 30 and Grade 2 Type A (<i>see 5.1</i>)	200 to 250 <i>HB</i>

7.2 The hardness of finished valve guides may be checked either in Brinell scale or in Rockwell 'B' scale. For Brinell scale the values shall be within those specified in **7.1**. For Rockwell 'B' scale, the hardness values shall be within the following range:

<i>Material</i>	<i>Hardness</i>
Grade FG 260, Grade 25 and Grade 2 (<i>see 5.1</i>)	89 to 102 <i>HRB</i>
Grade FG 300, Grade 30 and Grade 2 Type A (<i>see 5.1</i>)	94 to 102 <i>HRB</i>

8. HEAT TREATMENT

8.1 The as cast condition of valve guides is suitable for most applications. However, the valve guide material may be subjected to stress relieve annealing heat treatment subject to agreement between the purchaser and the manufacturer.

9. SURFACE ROUGHNESS

9.1 The surface roughness values shall be as indicated below:

- Surface roughness for valve guide outer diameter shall be between 0.2 to 1.6 μm *Ra*, and
- Surface roughness for valve guide bore shall be between 0.4 to 6.3 μm *Ra*.

*Method for Brinell hardness test for grey cast iron.

9.1.1 In case finer roughness values are required for special applications this shall be subject to agreement between the purchaser and the manufacturer.

9.2 Surface roughness inspection shall be carried out in accordance with IS : 3073-1967.*

10. ACCEPTANCE

10.1 All the dimensions and requirements in accordance with this standard shall be checked at the final inspection by the manufacturer.

10.2 On the finished valve guides a certain number of imperfections such as porosity may be considered acceptable provided such imperfections have no deleterious effect on the serviceability of the valve guides. The size, location and maximum number of imperfections acceptable are given in Appendix A.

11. MARKING

11.1 Each valve guide shall be legibly and indelibly marked with the name (brand or other) of the manufacturer, part number and batch number. The markings shall be such that they do not affect the function of the valve guides.

11.2 The valve guides may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

12. PRESERVATIVE TREATMENT

12.1 Each valve guide shall be coated with a suitable anticorrosive oil or medium. Alternatively, valve guides could be preserved with the aid of suitable chemically-treated papers.

13. PACKING

13.1 Valve guides shall be packed individually in polyethene or paraffin paper or equivalent bags. They shall then be packed in cardboard cartons in numbers as mutually agreed to between the purchaser and the supplier.

*Assessment of surface roughness.

APPENDIX A

(Clause 10.2)

ACCEPTANCE STANDARDS FOR POROSITY IMPERFECTIONS
IN VALVE GUIDES

A-1. TERMINOLOGY

A-1.1 Pinpoint Porosity — Pinpoint porosity consists of specks of a pepper type appearance with a maximum diameter of 0.38 mm and a maximum depth of 0.25 mm.

A-1.2 Major Porosity — Major porosity is classified into two classes:

Small imperfection	Above 0.38 mm up to 0.8 mm diameter
Large imperfection	Above 0.8 mm up to 1.6 mm diameter

A-2. ACCEPTANCE STANDARDS

A-2.1 Pinpoint porosity is acceptable on all surfaces except on oil scraper point (*see* Fig. 3).

A-2.2 Outside Diameter (*see* Fig. 3) — On outside surface following level of imperfection is acceptable:

Maximum number of imperfections on the valve guide outside surface	10 (total) (small imperfections — 5) (large imperfections — 5)
Minimum space between any two imperfections	3.2 mm

A-2.3 Bevelled Square End and Valve Guide Bore (*see* Fig. 3) — On bevelled square ends and valve guide bores following level of imperfection is acceptable:

Maximum number of imperfections on bevelled square end	6 (large and small)
Maximum number of imperfections on valve guide bore	6 (large and small)
Minimum space between any two imperfections on bevelled square end and valve guide bore	6.4 mm

A-2.4 Oil Scraper Point — On oil scraper point no imperfection is permissible.

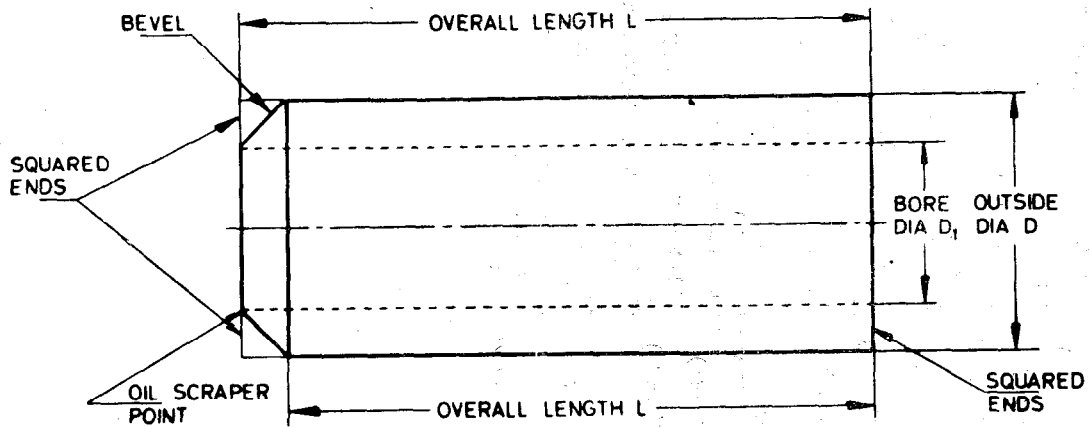


FIG. 3 LOCATIONS OF IMPERFECTIONS

(Continued from page 2)

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